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ABSTRACT

Protection of existing water supplies is critical to ensuring good health for people and animals alike. This program is aligned with the Izaak Walton League of American's Save Our Streams program which is based on the concept that students can greatly improve the quality of a nearby stream, pond, or river by regular visits and monitoring. The introduction explains how this classroom program has been correlated with Indiana State proficiencies across several curricular domains. The program is outlined as follows: (1) the objectives of the Save Our Streams and Waterways activities; (2) the teacher background notes containing the rationale and the purpose of the program; (3) more than 30 student activities suitable for individuals or small groups; (4) extensions of the previous activities designed to promote community awareness and involvement; (5) a vocabulary list; (6) a resource list of Indiana state agencies; and (7) appendices that contain a stream quality survey form, an insect counting guide which is useful for monitoring stream water quality, and a listing of the Izaak Walton League chapters within the state of Indiana. (JJK)

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Save Our Streams and Waterways

ED338509

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Introduction

The activities in this *Save Our Streams and Waterways* module have been correlated with the Indiana proficiencies and proficiency indicators. The appropriate subject areas, corresponding proficiency indicators, and skills are listed to assist classroom teachers who are correlating the proficiencies with their classroom curriculum. These skills will be reinforced through the utilization of this module.

Subject Area: Science

Proficiency Indicators: Communicating, assessing information, proposing solutions, analyzing systems, data gathering, examining interactions, applying science discoveries, preparing generalizations to unify observations and data, defining role that science and technology have played, forecasting, investigative skills, and identification.

Subject Area: Mathematics

Proficiency Indicators: Measuring, estimating, comparing, collecting data, and graphing.

Subject Area: Language Arts

Proficiency Indicators: Word recognition, comprehension, critical thinking, expression, appropriate forms (spelling, punctuation, capitalization, and usage), editing, revising, reflective thinking, judging, gathering, analyzing, retaining, and evaluating.

Subject Area: Social Studies

Proficiency Indicators: Tracing, examining, recording, analyzing, interpreting, assessing, evaluating, interviewing, summarizing, critiquing, hypothesizing, comparing, contrasting, and researching.

SAVE OUR STREAMS AND WATERWAYS
Grades K-8

OBJECTIVES:

1. Students will adopt a body of water near their school and monitor it throughout the school year.
2. Students will test and investigate the water quality of a nearby stream or waterway.
3. Students will walk a stream or river weekly to pinpoint possible sources of pollution.
4. Students will research the types of pollutants that effect water quality and determine if any of those are affecting their stream.
5. Students will construct a plan for improving the quality of water in their school community.
6. Students will support the Indiana Save Our Water Resource Network by communicating concerns, findings, resources, and activities with schools and resource agencies in Indiana and the nation.

CURRICULAR AREAS:

Art, Health, Language Arts, Mathematics, Music, Science, and Social Studies.

TEACHER BACKGROUND:

Water is a basic ingredient for our bodies. We need it to survive. People can live longer without food than water. This is because water regulates the temperature of the body; carries important nutrients to organs, cells, and tissues; and removes wastes from the body. Over 70 percent of our body weight is water. This is why it is important to eat and drink foods that contain water. Water also makes up over 80 percent of our blood and lubricates body joints. Each day humans must replace two quarts of water to maintain their health. Before most people use water in their homes, it is specially treated (purified) by local water companies. Indiana is fortunate. It has an outstanding supply of fresh water resources. We need to learn to appreciate water and use it wisely (conservation) so that people, animals, and plants living now and in the future will always have a safe and abundant supply.

Over 70 percent of the earth's surface is covered with water. The total amount of water on the earth remains essentially constant. Water changes form, but does not disappear. The water cycle has no starting or ending point. Water molecules you drink today may have been in the water consumed by a dinosaur that lived millions of years ago. However, it is important to know that only one percent of the world's water supply is available for human consumption. Therefore, water is a precious and limited resource.

The majority of people living in Indiana are served by public water supply systems. Cities obtain water form either streams, rivers, lakes, or ground water. The amount of water in a stream or river may be too small to supply demands during high use or low flow periods. Cities build reservoirs to store water to assure an adequate supply.

Nearly all water used by cities receive some form of treatment before use. A water treatment plant may put water through a number of purification processes, such as coagulation, settling, filtration, and disinfection.

Industry uses large amounts of water to produce consumer goods. It takes 10 gallons of water to produce one gallon of gasoline, 65,000 gallons to produce a ton of steel, 1000,000 gallons to make an automobile, and 136 gallons to make one loaf of bread. Food processing also uses large amounts of water. Fruits and vegetables must be washed before they are canned or frozen. Water is also used in the production of soft drinks and other beverages.

Only about two percent of the water used by industry is consumed. The remainder is returned largely to streams and lakes. These activities produce a variety of pollutants. Water that has a pH of less than seven is easily polluted with metals. Lead and arsenic are common industrial pollutants. These pollutants are cumulative in their effect on organisms, so even though they may be present in small amounts, they may, over time, accumulate in fish tissues and in people who eat the fish, leading to serious health problems.

Action must begin immediately to protect and manage Indiana's precious water supplies. We are fortunate to live in a state which contains a high volume of water resources. Some other states are not as fortunate. Arizona and California water supplies are disappearing rapidly. Water in these states is expensive and must be used carefully to prevent shortages.

Protection of the quality of existing water supplies is critical to ensuring good health for people and animals alike. All industries and companies which discharge wastes to a stream are required to have a NPDES permit which regulates the type and amount of wastes they can discharge. A stream may become polluted if a factory is not adhering to the restrictions of its NPDES permit or if its permit is inadequate. Inspecting the stream above and below a factory's discharge pipe will tell if the factory may be polluting the stream. (See Vocabulary.)

Students can monitor Indiana's streams, ponds, rivers, and lakes to help prevent deterioration of precious water resources. Students can adopt a nearby stream, pond, river or lake and become its guardian. Knowing the water's normal appearance, students can spot oil slicks, recently abandoned storage drums, high occurrences of oil erosion, illegal dumping of hazardous waste, dead fish, strange odors, and colors carried by pollution. Also, by monitoring the type of organisms living in the stream, students can tell if the water is polluted or clean. Students will also learn to recognize the differences between point and nonpoint source pollution. Point source pollution comes from a clearly identifiable source such as a factory discharge pipe. Nonpoint source pollution includes all other types and includes runoff from streets, farms, construction sites, etc.

This program is aligned with the Izaak Walton League of American's Save Our Streams (SOS) program. SOS is based on the concept that students can greatly improve the quality of a nearby stream or river by regular visits and monitoring, to discover signs of deterioration and looking for solutions to problems they discover.

ACTIVITIES:

Working in small groups or individually, student(s) will:

1. List reasons why water is important to health and life on spaceship Earth. Write ideas on board or tape record them.

2. Draw a map of the watershed for the adopted waterway. Since water runs downhill, all land activities in the stream's drainage basin will affect the quality of the stream's water. Identify farms, factories, cities, and towns which are in the area. Runoff from the land, as well as discharges from pipes, affect a stream's water quality.

3. Report how people have affected the quality of water in their community. (positively or negatively?)

4. Locate on a map the source(s) of water for their school and community.

5. Interview at least four (4) students and adults to determine their concerns and feelings about water. Tape record interviews.

6. Visit a local water treatment plant to observe and investigate how water is purified and treated.

7. Research how water needs and costs vary from state to state. Compare Indiana to California or Arizona.

8. Draw a map tracing water resources from the school to its source. On the map, show where runoff water and sewage goes as it leaves the school. Follow their map to the point where the runoff water and sewage goes.

9. Interview the city or county sanitarian about local water resources to determine:

    a. What are the problems?
    b. What are projected needs?
    c. Is the water treatment adequate?

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10. Photograph or collect pictures and articles which demonstrate how water is used or abused in the community.

11. Write a creative story, poem, or play which describes the value of water resources to humans, plants, and wildlife.

12. Design a plan for improving the quality of water resources in their community. Present plan to students and adults. Activities might include:

    a. Letters to government, industry, etc.
    b. A plan of action for the school to implement.
    c. Erosion control projects to prevent creek banks and soil from eroding.
    d. Educating land owners on practices to prevent deterioration of water quality, such as best management practices for farmers.

13. Interview each other on a tape recorder about ways to conserve water.

14. Write a short story about a selected animal or plant depending on water for survival. Suggested plants and animals:

    a. Frog
    b. Minnow
    c. Water Lily
    d. Tree
    e. Grass
    f. Corn or soybeans

15. Write a short water adventure story, water fantasy tale, or poem about the sea, ocean, river, lake or nearby stream. Display those stories on a bulletin board. Have students draw pictures to go with stories.

16. Select magazine or newspaper stories and pictures which tell or show how water is used and report this to the class.

17. Write to or interview people from other countries to find out how they use water.

   a. Where does their water come from (streams, lakes, reservoirs, springs, etc.)?
   b. How is water made safe to drink?
   c. What water resource problems do they have?

18. Adopt a stream, pond, lake, or river nearest the school to monitor and study. Research its importance to the school and community.

19. Use the Save Our Streams (SOS) kit and program from the Izaak Walton League of American (IWLA) to monitor the adopted water source. See resource section for address.

20. Register the Save Our Streams project with the IWLA. Before adopting a waterway, it is essential that you obtain permission from the landowners along the stream or waterway. They may want to become involved in your project.

21. Contact your State Department of Natural Resources for free brochures on preventing soil erosion, building fisheries, planting trees, and educating homeowners. (See Project WILD in resource list.)

22. Publicize the SOS program to parents, conservation groups, community leaders, school board, farmers, and civic groups. This will help gain support.

23. Walk the stream or waterway to inventory problems, beauty, wildlife, plants, outdoor education, potential water quality, and source (where stream begins – look on map).

24. Use the senses to make observations about the stream or waterway:

   a. What did you see?
   b. What did you hear?
   c. What did you feel?
   d. What did you smell?

25. Measure the depth of the water in three (3) locations along the stream. Try to do this in the middle of the stream. Use this data to determine the average depth.

26. Measure the width of the stream in three (3) locations along the stream. Determine the average width.

27. Measure the temperature of the water in three (3) locations. Determine average temperature.

28. Sketch the stream to show wildlife, plants, beauty, problems, uses, etc.

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29. Write observations in a SOS journal. Write words, poems, expressions, impressions, scientific data, and historical information in journal.

30. Test the water by using a HACH kit to determine dissolved oxygen levels, alkalinity, phosphates, ammonia, etc. (See resource list.) Record information in a journal and on SOS Stream Quality Survey. (See Annex A.) Test the water at three different locations on the stream or waterway.

31. Test the quality of water of several streams in the community, identifying differences in quality and reasons for the differences. The high school science department may have a HACH kit you can borrow to test streams and waterways.

32. Collect animals from a stream with a seine or screen and use the Stream Insect and Crustaceans chart (See Annex B) to help determine if the water quality is good, fair or poor. Return animals to stream after study and wash hands thoroughly. Record this information on the SOS survey form.

33. Contact the nearest Izaak Walton League Chapter and brief their members about the SOS and waterways program. Ask for support and assistance.

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EXTENSIONS:

1. Join the Rivers and Wildlife program sponsored by the National Audubon Society (See resource section).

2. Conduct a SOS and Rivers and Wildlife information program for the community by designing an exhibit for shopping centers, PTA meetings, service clubs, etc.

3. Prepare a fact sheet for distribution to the public.

4. Sponsor a stream or river clean-up.

5. Conduct a weekend stream or river educational walk.

6. Prepare a slide show or video about the stream or waterway.

7. Write a song about the stream or waterway. Develop an album cover and a marketing plan for your song.

8. Design SOS bumper stickers, decals, posters, or placemats and market them to parents, businesses, etc.

9. Plan a SOS day for the school. Invite speakers, exhibitors, water resource specialists and high school science teachers to the school to teach classes, conduct experiments, etc.

10. Establish a state and national SOS network with schools, IWLA chapters, water resource agencies, etc.

VOCABULARY

Save Our Streams Vocabulary List

Algae - Simple plants which do not grow true roots, stems, or leaves and live mainly in water providing food for the food chain.

Culvert - A closed passageway (such as a pipe) under roads and embankments which drains surface water.

Dump - A land site where trash is left exposed in a way which does not protect the environment.

Effluent - An out-flowing branch of a main stream or lake; Waste material (i.e., liquid industrial refuse, sewage) discharged into the environment.

Erosion - The wearing away of land by wind or water.

Floodplain - A low area of land, surrounding streams or rivers, which holds the overflow of water during a flood.

Flow - The direction of movement of a stream or river.

Groundwater - A supply of freshwater under the earth's surface which forms a natural reservoir.

Leaching - The process where material in the soil (such as nutrients, pesticide chemicals) are washed into lower layers of soil or are dissolved and carried away by water.

Monitoring - To watch and care for a stream on a regular basis.

Nonpoint Source Pollution - A type of pollution whose source is not readily identifiable – such as pollution caused by car oil carried off city streets by rainwater.

NPDES - National Pollutant Discharge Elimination System Permits which are required for all industries discharging wastes into a waterway. NPDES permits control the type and amount of wastes allowed in a factory's effluent and are assigned by state regulatory agencies.

Nutrient - Substance which is necessary for growth of all living things (i.e. oxygen, nitrogen, and carbon).

Pesticide - A chemical that kills insects and rodents.

Point Source Pollution - A type of pollution that can be tracked down to an easily noticeable cause – such as discharge pipes, people putting chemicals and trash into water.

Pollutant - Something that makes land, water, and air dirty and unhealthy.

Pollution - The presence of waste that makes the world around us dirty and contaminated.

Pond-Riffle - In a stream or river, areas of deep slow moving water (pools) or areas of shallow, fast moving water.

Riffle - A shallow area of water with a fast current.

Runoff - Water, including rain and snow, which is not absorbed into the ground – instead it flows across the land and eventually runs into streams and rivers. Runoff can pick up pollutants from the air and land, carrying them into the stream.

Sediment - Soil, sand, and materials washed from land into waterways.

Sedimentation - When soil particles (sediment) settle to the bottom of a waterway.

Slumping - Sections of soil with or without vegetation that have come loose and slipped into the stream.

Stagnation - When there is little water movement and pollutants are trapped in the same area for a long period of time.

Toxic Substances - Poisonous matter (either chemical or natural) which causes sickness, disease and/or death to plants or animals.

Undercutting - A type of erosion which occurs when fine soils are swept away by the action of the stream, especially around curves. The result is an unstable overhang.

Watershed - All the land that serves as a drainage for a specific stream or river.

Watertable - The upper level of groundwater.

Waterway - A natural or man-made place for water to run through (such as a river, stream, creek, or channel).

Wetland - An area of land that is regularly wet or flooded, such as a marsh or swamp.

Indiana and National Resources

Project WILD
Aquatic Education Activity Guide

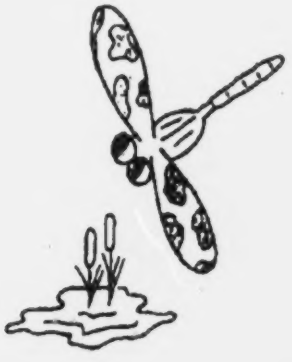
Contact: Warren Gartner
Project WILD
6013 Lakeside Boulevard
Indianapolis, IN 46278
(317) 290-3223

The Outdoor Classroom and Wet and Wild Water Module

Contact: Joe Wright
Office of School Assistance
Indiana Department of Education
Room 229, State House
Indianapolis, IN 46204-2798
(317) 232-9141

Rivers and Wildlife Resource Guide

Contact: National Resource Guide
613 Riversville Road
Greenwich, CT 06831



The Indiana Department of Education appreciates the assistance and support of the Izaak Walton League of America in helping design this water resource module for middle grade school educators and students. If you have specific questions about water quality monitoring or obtaining equiment, please contact:

Karen Firehock
Save Our Streams Kits and SPLASH Newsletter
Save Our Streams Coordinator
Izaak Walton League of America
1401 Wilson Boulevard, Level B
Arlington, VA 22209
(703) 528-1818

The Save Our Streams Kit costs $5.

See Attached List of Izaak Walton League Chapters to Contact for Assistance with School Projects.

SAVE OUR STREAMS
Stream Quality Survey

The purpose of this form is to aid you in gathering and recording important data about the health of your stream. By keeping accurate and consistent records of your observations and data from your insect count, you can notice and document changes in water quality. Refer to the SOS insect card and guide to learn how to trap and identify the organisms.

Stream _____ Station _____

County _____ Location _____

Group or individual _____ Number of participants _____

You should select a riffle where the water is not running too fast (ideal depth is 3 - 6 inches), and the bed consists of cobble-sized stones or larger.

Area of monitored riffle (should be 3 foot square) _____

Water depth (inches) _____ Water temperature (°F) _____

Sample number _____ Date _____ Time _____

Type of test: _____ macroinvertebrate count, _____ chemical test kit, _____ other

Water appearance:
_____ brownish
_____ clear
_____ colored sheen (oily)
_____ foam
_____ milky
_____ muddy
_____ scum
_____ other

Odor:
_____ rotten egg
_____ musky
_____ none

Stream bed coating:
_____ black
_____ brown
_____ orange/red
_____ yellow

Stability of stream bed:
Bed sinks beneath your feet in:
_____ no spots
_____ a few spots
_____ many spots

% bank covered by plants, rocks and logs is:	***Good***	***Fair***	***Poor***
	> 70%	30% - 70%	< 30%
Stream bank	_____	_____	_____
Top of bank	_____	_____	_____

Bed composition of riffle:
_____ % silt (mud)
_____ % sand (1/16" - 1/4" grains)
_____ % gravel (1/4" - 2" stones)
_____ % cobbles (2" - 10" stones)
_____ % boulders (> 10" stones)

Algae color:
_____ light green
_____ dark green
_____ brown coated
_____ matted on stream bed
_____ hairy

Algae located:
_____ everywhere
_____ in spots
_____ % bed cover

(> = greater than, < = less than)

Izaak Walton League: 1701 N. Fort Myer Drive, Suite 1100, Arlington, VA 22209 • (703) 528-1818

MACROINVERTEBRATE COUNT

Use letter codes (A = 1 - 9, B = 10 - 99, C = 100 or more) to record the numbers of organisms found in a 3 foot by 3 foot area. Then add up the number of letters in each column and multiply by the indicated index value.

GOOD	FAIR	POOR
____ caddisfly larvae	____ beetle larvae	____ aquatic worms
____ dobsonfly larvae	____ clams	____ blackfly larvae
____ mayfly nymphs	____ crane fly larvae	____ leeches
____ other snails	____ crayfish	____ midge larvae
____ riffle beetle adult	____ damselfly nymphs	____ pouch snails
____ stonefly nymphs	____ dragonfly nymphs	
____ water penny larvae	____ scuds	
	____ sowbugs	
	____ atherix	
____ # of letters	____ # of letters	____ # of letters
____ times 3 =	____ times 2 =	____ times 1 =
____ index value +	____ index value +	____ index value

Now add together the three index values = _____ total index value.
Compare this total index value to the following numbers to determine the water quality of your stream. Good water quality is indicated by a variety of different kinds of organisms, with no one kind making up the majority of the sample.

____ ***Excellent (> 22)*** ____ ***Good (17 - 22)***

____ ***Fair (11 - 16)*** ____ ***Poor (< 11)***

Note: You should test at least 3 different riffles within a 24-foot area to ensure that you have a truly representative sample which includes all key organisms. You may also want to sample some of the rocks in slower-moving water, nearer the banks, because mayflies and stoneflies are sometimes found there instead.

Fish water quality indicators:
_____ scattered individuals
_____ scattered schools
_____ trout (good)
_____ bass (good)
_____ catfish (poor to fair)
_____ carp (poor)

Barriers to fish movement:
_____ beaver dams
_____ dams
_____ waterfalls
_____ other
_____ none

Land uses in watershed:
_____ factories _____ farming _____ fields _____ homes _____ stores _____ woods

Are there any discharging pipes? _____ no _____ yes If so, how many?_____

Did you test above and below the pipes to determine any change in water quality and were changes noticed?

_____

Describe % and type of litter in and around the stream: _____

_____

_____

Insects & Stream Quality

How clean is your stream?

You can answer that question by counting the insects in your stream. Many stream-dwelling organisms are sensitive to changes in water quality. Their presence or absence can serve as indicators of environmental conditions. Macroinvertebrates (visible spineless animals), especially insects, are easy to find. By following the technique below and filling out the SOS Stream Survey, you can diagnose your stream's water quality.

Finding the Insects

The equipment required includes a kick-seine (a fine mesh net with a supporting pole on each side) or an old window screen with no holes, tweezers, a clear plastic container, several jars for collecting, and a microscope or magnifying glass.

1. Select a riffle typical of the stream, that is, a shallow fast-moving area with a depth of 3 - 12 inches and stones which are cobble-sized (2 - 10 inches) or larger.

2. Place the kick-seine or screen at the downstream edge of the riffle. Be sure that the bottom of the seine or screen fits tightly against the stream bed (you may want to use rocks to hold the net down tightly), so no insects can escape along this point. Also, don't allow any water to flow over the screen top. This too could allow insects to escape.

3. Disturb the stream bed for a distance of 3 feet upstream of the kick-seine. Brush your hands over all rock surfaces to dislodge any attached insects. Stir up the bed with hands and feet until the entire 3 foot square area has been worked over. All detached insects will be carried into the net. For 60 seconds, and no longer, kick the stream bed with a sideways motion towards the net. This may bring up a few ground dwellers.

4. When step 3 is completed, remove the seine with a forwards scooping motion. The idea is to remove the net or screen without allowing any insects to be washed from its surface.

5. Place the net on a flat, light-colored area. Using tweezers, pick all the insects from the net and place them in your collecting container. Any creature that moves, even if it looks like a worm, is part of the sample. Look closely, since most insects are only a fraction of an inch long.

6. Once all insects have been removed from the seine, separate the insects into look-alike groups. Use primarily body shape and number of legs and tails, since the same family can vary some in size and color (see insect card to aid in identification). Streams in naturally alkaline areas have fewer numbers of each insect. Record your findings on the SOS Stream Survey and tabulate your results to determine the water quality.

Studying the Find

To make sure your results are accurate, take a quick second sample from another spot, preferably a riffle. If your results are similar, you might want to check another spot about a quarter mile upstream. If you find a decrease in water quality, check the stream for discharge pipes, evidence of erosion, farm runoff, and other possible sources of stream pollution.

I N S E C T C O U N T A N D W A T E R Q U A L I T Y

In the case of:	Look for:
Little variety of insects, with great abundance of each kind	Water overly enriched with organic matter
Only one or two kinds of insects, in great abundance	Severe organic pollution
A variety of insects, but only a few of each kind, or No insects, but the stream appears clean	Toxic pollution

Stream Problems and Their Impact on Insect Life:

a. PHYSICAL PROBLEMS--may include excessive sediment from erosion, street runoff, or a discharge pipe. Sediment may: create poor riffle characteristics; contribute to excessive flooding; reduce flow; change temperature; and smother aquatic life. The result is usually a reduction in the number of all animals in the study area.

b. ORGANIC POLLUTION--is from excessive human or livestock wastes or high algae populations. The result is usually a reduction in the number of different kinds of insects, leaving more collectors/scrapers (such as the caddisflies).

c. TOXICITY--includes chemical pollutants such as chlorine, acids, metals, pesticides, and oil. The result is usually a reduction in the number of insects. Usually a toxic problem is the only condition which will kill all stream life.

When considering land use as the controlling factor in stream quality, look not just at the area visible from the stream, but at all the land draining to the stream--the watershed. The SOS publication, "Preservation & Enhancement of Stream Quality" (page 36), describes the procedure for defining the watershed area. If the stream drains an intensely developed area, do not be surprised if no insects are found at all. Should this be the case, consider visiting a forest or agricultural stream for a sampling comparison. You will probably find the difference quite startling.

Sources causing poor or fair stream quality include: sewage treatment plants, industries, construction sites, sewer overflows, landfills, and mining operations. A pollution source may be identified by sampling the stream at one quarter mile intervals upstream from the initial sampling point until quality improves. The pollution sources should be located somewhere between the point of quality improvements and the last location where degraded conditions were found.

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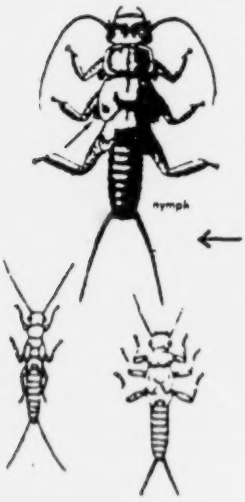
1701 N. Fort Myer Drive, Suite 1100 Arlington, Virginia 22209

Stream Insects & Crustaceans

GROUP 1 TAXA — GOOD WATER QUALITY



STONEFLY:
ORDER PLECOPTERA

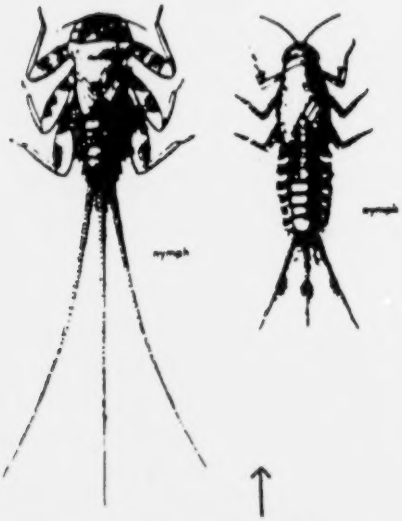
1/2 - 1 1/2", 6 legs with hooked tips, long antennae, 2 hair-like tails.

DOBSONFLY (HELLGRAMMITE):
SUBORDER MEGALOPTERA

3/4 - 4", dark-colored, 6 legs, many long feelers on lower half of body, short antennae, 4 hooks at back end.

CADDISFLY:
ORDER TRICHOPTERA

Up to 1/2", 6 hooked legs on upper third of body, 2 hooks at back end. May be in a case, with its head sticking out.



MAYFLY: ORDER EPHEMEROPTERA

1/4 - 1", brown, plate-like gills on sides of body, 6 large hooked legs, many long feelers on lower half of body, antennae, 2 or 3 long hair-like tails.

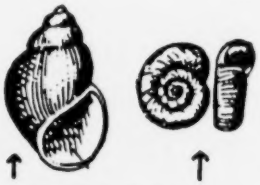
WATER PENNY: ORDER COLEOPTERA

1/4", saucer-shaped body with a raised bump on one side and 6 tiny legs on the other side.

Immature riffle beetle.

RIFFLE BEETLE: ORDER COLEOPTERA

1/4", oval body covered with tiny hairs, 6 legs, antennae.

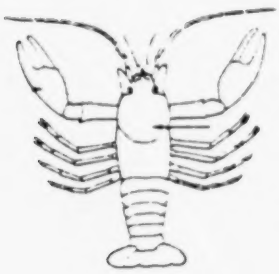


OTHER SNAILS:
PHYLUM MOLLUSCA

Shell opens on right or in center.

GROUP 2 TAXA — FAIR WATER QUALITY

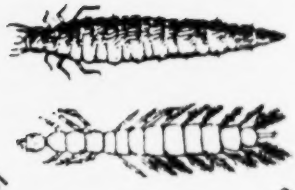
SOWBUG: ORDER CRUSTACEA
1/4 - 3/4", gray oblong body wider than it is high, more than 6 legs, antennae.



CRAYFISH:
ORDER CRUSTACEA
1/2 - 6", 2 large claws, 8 legs, resembles small lobster.

SCUD: ORDER CRUSTACEA
1/4", fat body higher than it is wide, swims sideways, more than 6 legs, resembles small shrimp.

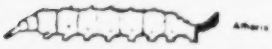
DAMSELFLY: ORDER ODONATA
1/2 - 1", large eyes, 6 hooked legs, 3 broad oar-like tails.



BEETLE LARVA:
ORDER COLEOPTERA
1/4 - 1", light-colored, 6 legs on upper half of body, feelers, antennae.

CLAM:
PHYLUM MOLLUCA

DRAGONFLY:
ORDER ODONATA
1/2 - 2", large eyes, 6 hooked legs.



WATERSNIPE FLY LARVA:
ORDER DIPTERA (ATHERIX)
1/4 - 3/4", green, many caterpillar-like legs, conical head, feathery "horn" at back end.

CRANE FLY: ORDER ODONATA
1/3 - 2", green or brown, plump caterpillar-like segmented body, finger-like lobes at back end.

GROUP 3 TAXA — POOR WATER QUALITY

AQUATIC WORM: ORDER OLIGOCHAETA
1/4 - 1", can be very tiny, thin worm-like body.

MIDGE FLY LARVA: ORDER DIPTERA
Up to 1/4", worm-like segmented body, 2 legs on each side.

POUCH SNAIL:
PHYLUM MOLLUSCA
Shell opens on left.

LEECH:
ORDER HIRUDINEA
1/4 - 2", brown, slimy body, ends with suction pads.

BLACKFLY LARVA:
ORDER DIPTERA
Up to 1/4", one end of body wider, suction pad.

SAVE OUR STREAMS
RESOURCE LIST

1988

AVAILABLE FROM THE IZAAK WALTON LEAGUE:

Learning to Love Streams: Save Our Streams - A collection of teacher lesson plans for stream activities and monitoring. Designed to test stream water quality and pinpoint problems. A good educational tool for students 4th - 12th grades. $2.00 each.

SOS Kit - Everything you need to start an effective and active stream monitoring program. Includes A New Citizens Guide to Clean Water, SOS newsletter Splash, SOS stream survey, vocabulary list, stream insect identification and chart, promotion hints, erosion fact sheet, project ideas, registration card, poster, bumper sticker, and more. $5.00 each.

"A Stream Watchers Stream Guide" - Flyer with tips on identifying pollution in streams and practices to reduce it. $5.00 per 100.

Splash - Quarterly SOS newsletter which provides updates on national stream monitoring programs, tips on how to be an effective activist, and explanations of how major industries affect water quality. Free.

Media and Publicity - A three page guide on how to get the media interested and involved in your SOS program. Free.

Citizens' Guide to Conservation Action. 1983. Arlington, VA. A 52 page guide to grassroots organizing for individuals or groups. Explains environmental problem recognition, local organization methods, program implementation and how to interest and influence the media. $3.57 each.

SOS Kids' Activities - A kids' guide to discovering pollution problems. Explains the causes of pollution and describes activities kids can do to combat the problem. Written for kids ages 6 to 13. Free. Additional copies $.25 each.

*SOS Bumper Sticker - Blue and green, 12" x 3". $.50 each

*SOS Poster - Fisherman 20" x 43" $2.00 each

Telephone Resources:

Citizen's Directory for Water Quality Abuses - A 56 page state-by-state telephone directory listing the environmental agency telephone numbers for reporting pollution emergencies or obtaining information about streams and water quality. Includes water pollution appendix. Available for $1.00 each or one listing for your state only - free.

THE IZAAK WALTON LEAGUE OF AMERICA, INC.
1401 Wilson Blvd. Level B
Arlington, Virginia 22209

Hands on Streams and Rivers by Richard Klein. - A 31 page guide with in-depth methods for stream quality monitoring including explanation of measurement of channel area, channel movements, floodplain area, stream flow, suspended/bed sediments, temperature, and chemical/biological aspects, algae, crustaceans, insects and fish. This guide explains how to recognize and test for all of these indicators as well as their importance to the health and preservation of the stream. Appropriate for high school students through adults. $2.00 handling fee.

Preservation and Enhancement of Stream Quality by Richard Klein - A 34 page guide which outlines physical, chemical and biological aspects of water quality monitoring including ways that a stream can become polluted, how to recognize this pollution and and how to combat it. Encompasses sediments, organic substances, nutrients, toxic substances, temperature, storm water and physical alternations. $2.00 handling fee.

Stream Quality Assessment By Richard Klein - A 23 page guide which explains specifically how to conduct water quality assessment tests using several different methods including chemical and biological tests and charts. $1.00 handling fee.

ADDITIONAL RESOURCES: (We do not stock.)

Water Quality Testing Kits:

Chemical Testing Kits - a large selection of kits to test for many different types of pollution indicators such as alkalinity, phosphates, ammonia, etc. Call the Hach Chemical Company toll free: 1-800-247-3990 or write for their catalog to: Hach Chemical Company, P. O. Box 907, Ames, Iowa 50010. Prices start at $20.00 and increase depending on the kit.

Resources for Teachers:

An Outline for Teaching Conservation in Elementary Schools: USDA Soil Conservation Service: PA-268: and

Teaching Soil and Water Conservation - A Classroom and Field Guide; USDA Soil Conservation Service: PA-341 Write to: USDA Soil Conservation Service, Public Information, P.O. Box 2890, Washington, D.C. 20013 or contact your local Soil and Water Conservation District (located in county seat).

"The Basis of Life" - A comic book on water; Soil Conservation Society of America, 7515 Northeast Akeny Road, Akeny, IA 50021. $.35 each.

Environmental Films:

To request a listing of environmental films and rental/purchase fees write:

The National Audiovisual Center
Information Services Section
8700 Edgeworth Dr.
Capitol Heignts, MD 20743-3701 or call (301) 763-1896

IZAAK WALTON LEAGUE OF AMERICA

INDIANA CHAPTERS

INDIANA DIVISION
Terrence McCloskey
President
2819 Gibson
Hammond, IN 46232
(219) 844-5015

Ed Wisinski
Save Our Streams Officer
Indiana Division
129 North Arbogast
Griffith, IN 46319
(219) 294-9070

INDIANA CHAPTERS

ALEXANDRIA CHAPTER
George Reismiller
President
407 Walnut Street
Alexandria, IN 46001
(317) 724-3353

ARGOS CHAPTER
Charles Gaby
President
20489 Linden Road
Argos, IN 46501
(219) 892-5742

DEKALB COUNTY CHAPTER
Mary Anna Entwislle
President
1957 County Road 68, R R 3
Auburn, IN 46706
(219) 925-4637

PORTER COUNTY CHAPTER
Herb Read
70 East State Park Boundry Road
Chesterton, IN 46304
(219) 926-2224

CLINTON CHAPTER
Charles Heiser
Save Our Streams Officer
824 Sycamore
Clinton, IN 47842
(317) 832-9969

EVANSVILLE CHAPTER
John W. Wirthwein
President
5111 Hunter Road
Boonville, IN 47601
(812) 925-3863

FORT WAYNE CHAPTER
Phyllis Johnson
5415 Renfrew Drive
Fort Wayne, IN 46803
219) 485-1438

GENE STRATTON PORTER CHAPTER
Thomas E. Dustin
President
1802 Chapman Road
P. O. Box 141
Huntertown, IN 46748
(219) 637-6264

HOOSIER HILLS CHAPTER
William Hayden
President
R R 18, Box 270
Bedford, IN 47421
(812) 279-1639

PUTNAM COUNTY CHAPTER
Hearald Stanger
President
Rt. 1, Box 269
Fillmore, IN 46128
(317) 246-6464

GRIFFITH CHAPTER
Jim Sweeney
Save Our Streams Officer
P. O. Box 33
Griffith, IN 46319
(219) 322-7239

HUNTINGTON COUNTY CHAPTER
Donald E. Collins
Save Our Streams Officer
P. O. Box 12
Markle, IN 46770
(219) 758-3411

HOWARD COUNTY CHAPTER
Royce R. Brideman
President
1834 South Armstrong
Kokomo, IN 46902
(317) 457-8661

LAKESIDE WOMEN'S CHAPTER
Connie L. Byers
President
315 East Barkdol
Kokomo, IN 46901
(317) 472-5758 Home
(317) 457-8281 Business

GLEN PARK CHAPTER
John J. Kopil
First Vice President
4834 Pennsylvania Street
Gary, IN 46409
(219) 887-3357 HOME
(219) 944-4834 BUSINESS

TIMBERLOST CHAPTER
Jodi Pierce
President
321 Hickory Street
Michigan City, IN 46360
(219) 872-8426

MICHIGAN CITY CHAPTER
Terrence McCloskey
2819 Gibson
Hammond, IN 46323
(219) 844-5015

NORTH MANCHESTER CHAPTER
Richard H. Zubowski
President
505 East 9th Street
North Manchester, IN 46962
(219) 982-2379 Home
(219) 982-2161 Business

MIAMI CHAPTER
Alfred R. Day
President
462 West 5th
Peru, IN 46970
(317) 472-2868

CENTRAL INDIANA CHAPTER
James O. Hodshire
Secretary
R R 1, Box 266
Clayton, IN 46118
(317) 539-2752 Home
(317) 242-5644 Business

CASS COUNTY CHAPTER
Ernest Gasho
Save Our Streams Officer
904 16th Street
Logansport, IN 46967
(219) 722-3932

GRANT COUNTY CHAPTER
Tim Wentz
Save Our Streams Officer
652 North 800 West-27
Converse, IN 46919
(317) 384-5574 Home
(317) 662-4666 Business

ST. JOSEPH COUNTY CHAPTER
J. A. Bogucki
President
66603 Pine Road
North Liberty, IN 46554
(219) 656-4271

TERRE HAUTE CHAPTER
Wayne Rader
President
2101 Putnam
Terre Haute, IN 47803
(812) 232-2144

MARQUETTE CHAPTER
Beverly J. Coe
President
5726 Old Porter Road Lot #10
Portage, IN 46368
(219) 762-0899

MILLER CHAPTER
Arthur E. Clark, Jr.
Save Our Streams Officer
1083 North Pearson Road
Chesterton, IN 46304
(219) 926-3704

DIANA CHAPTER
Carl and Doris Davis
Presidents
Sumava, IN 46379
(219) 552-9065

WABASH COUNTY CHAPTER
Tim Wentz
Save Our Streams Officer
652 North 800 West-27
Converse, IN 46919
(317) 384-5574 Home
(317) 662-4666 Business

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Office Location:

Indiana Department of Education
Center for School Improvement and Performance
Office of School Assistance
Two Market Square Center
251 East Ohio Street
Indianapolis, IN
(317) 232-9141

Mailling Address:

Room 229, State House
Indianapolis, IN 46204-2798